



*Los Banos Grandes Facilities  
Sycamore Pilot Program - Report Number Four*

D-054344

D-054344

**Memorandum**

Date: December 7, 1995

To: Rodney G. Mayer, Chief  
State Water Project Planning Branch

Mark W. Cowin, Project Manager  
Los Banos Grandes Facilities  
Division of Planning

From: **Department of Water Resources**

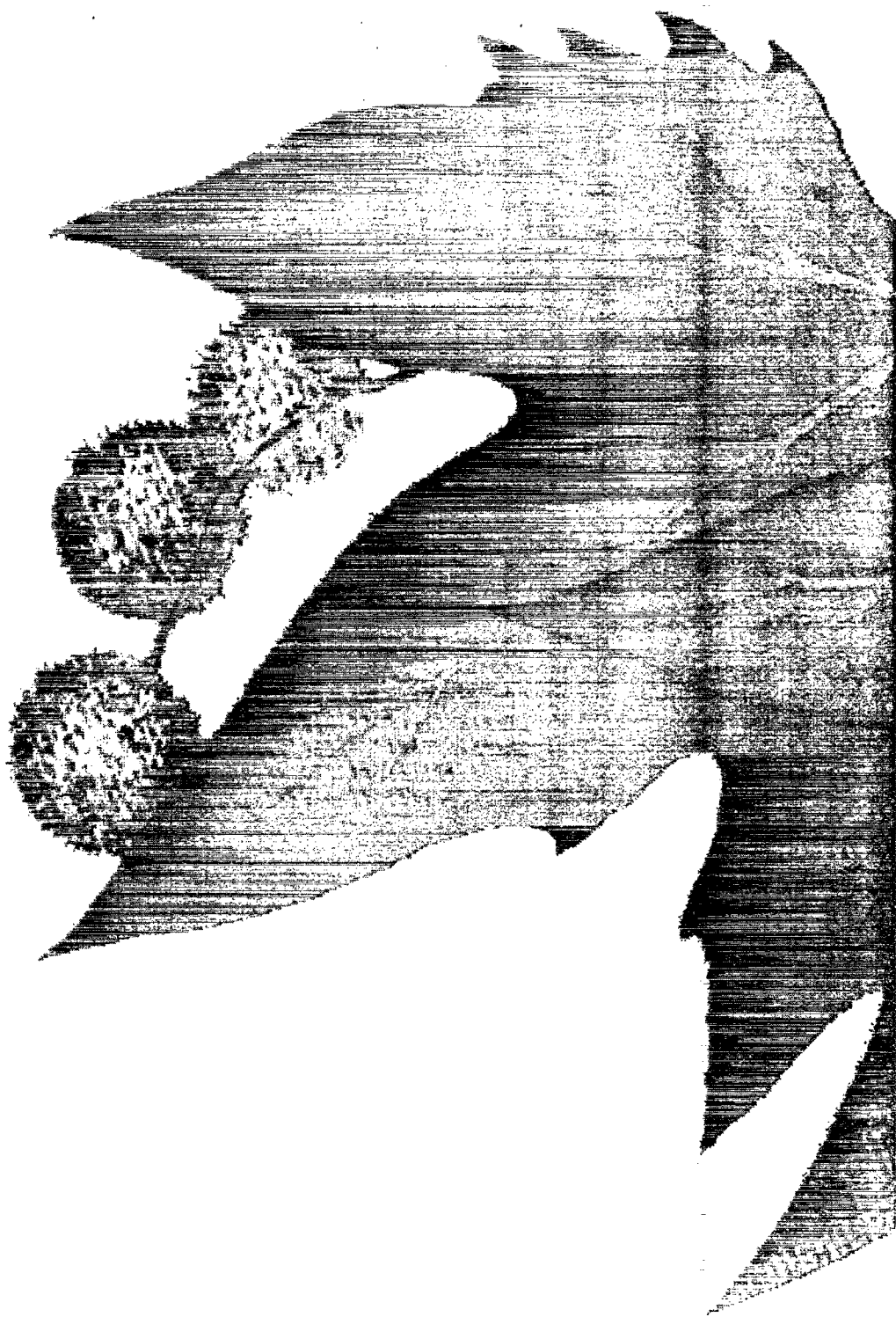
Subject: Los Banos Grandes Facilities Sycamore Pilot Program  
Report Number IV

This is the fourth in a planned series of memorandum reports summarizing the progress and status of the Los Banos Grandes Facilities Sycamore Pilot Program.

In 1990, The Department published the Los Banos Grandes Facilities Feasibility Report, recommending construction of a 1.73 million acre-foot reservoir and associated facilities on Los Banos Creek in western Merced County. Since 1990, actions to protect the San Francisco Bay/Sacramento-San Joaquin River Delta Estuary have affected State Water Project operations in the Delta and impacted the feasibility of the Los Banos Grandes project. The Department is currently reevaluating this project and possible alternatives for increasing the supply reliability of the State Water Project. If this reevaluation results in a decision to again move forward with advanced planning for Los Banos Grandes, one issue which must be addressed is the project's impact on sycamore alluvial woodland. The Los Banos Grandes Facilities, as formulated in the Department's 1990 feasibility report, would inundate 426 acres of SAW. This loss of wildlife habitat is of significant value and would be mitigated by creating and restoring other SAW habitat in nearby areas. The Los Banos Grandes Sycamore Pilot Program was initiated in 1989 to develop effective methods for growing and propagating sycamores and to demonstrate the viability of the proposed mitigation plan for SAW.

The first memorandum report, published in August 1991, describes the implementation of the overall LBG Sycamore Pilot Program and its components. A second report, published in December 1992, updates the progress of the project to that date. The third, published in July 1994, reviews and summarizes the progress and findings of the program, and substantiates the importance of water and periodic browsing to the survival and procreative ability of the sycamore. The enclosed report describes the progress to date and describes a new component of the study: The SAW Demonstration Restoration Project located at Orestimba Creek.

SURNAME DWR 155 (REV. 286)	<i>Sergio Guillén</i> 12/8/95	<i>M. Cowin</i> 12/8/95	<i>Rodney G. Mayer</i> 12/8/95
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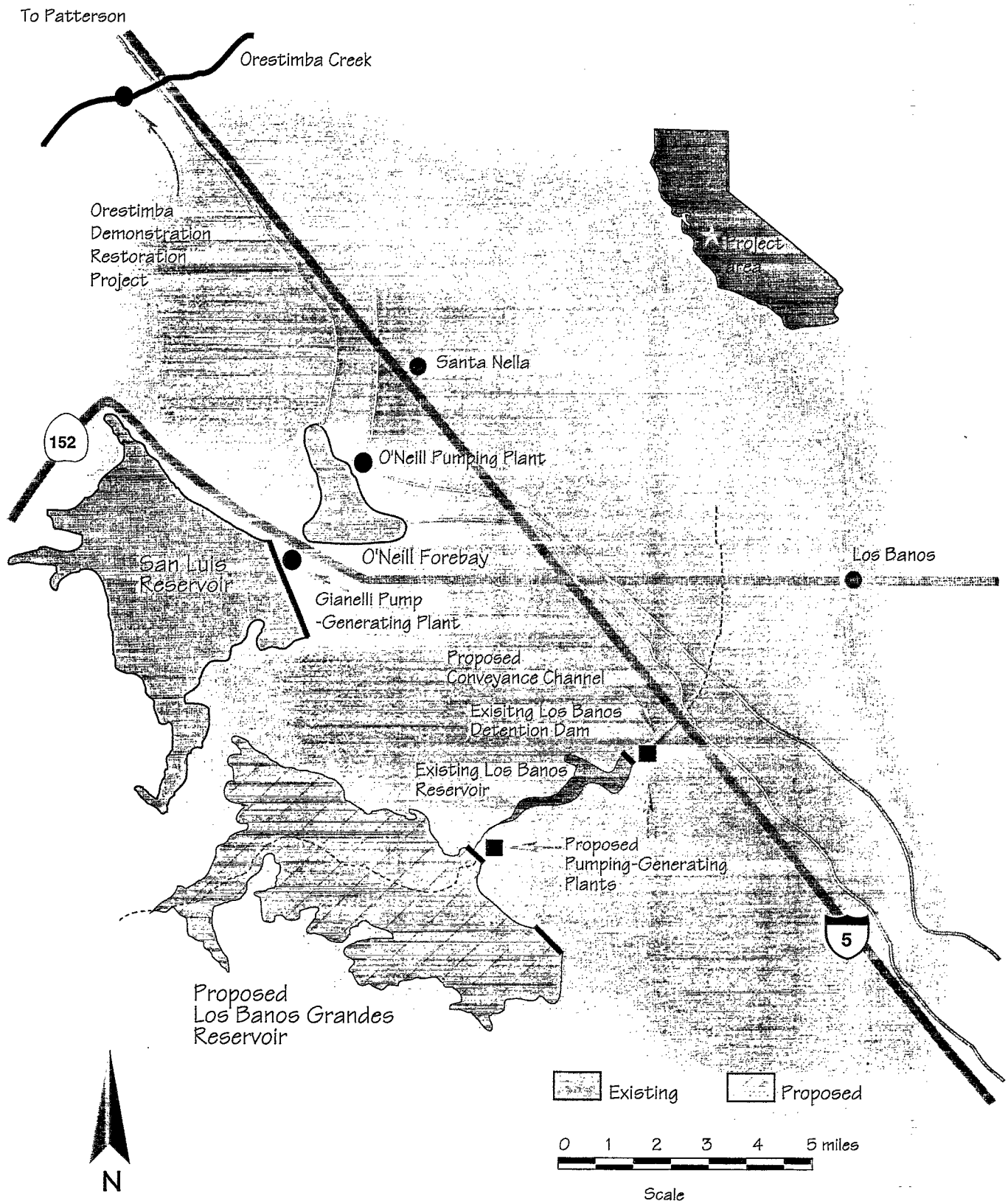
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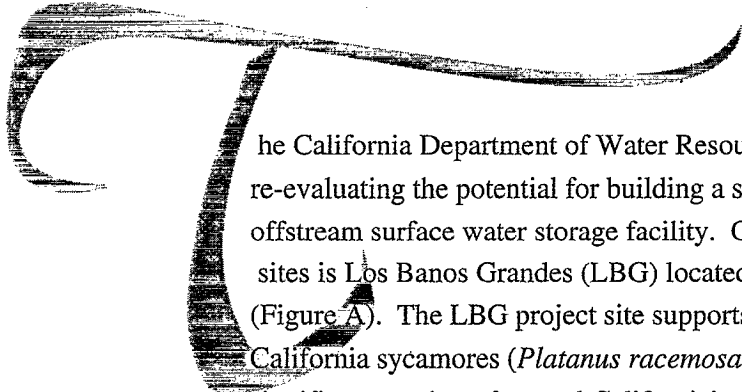
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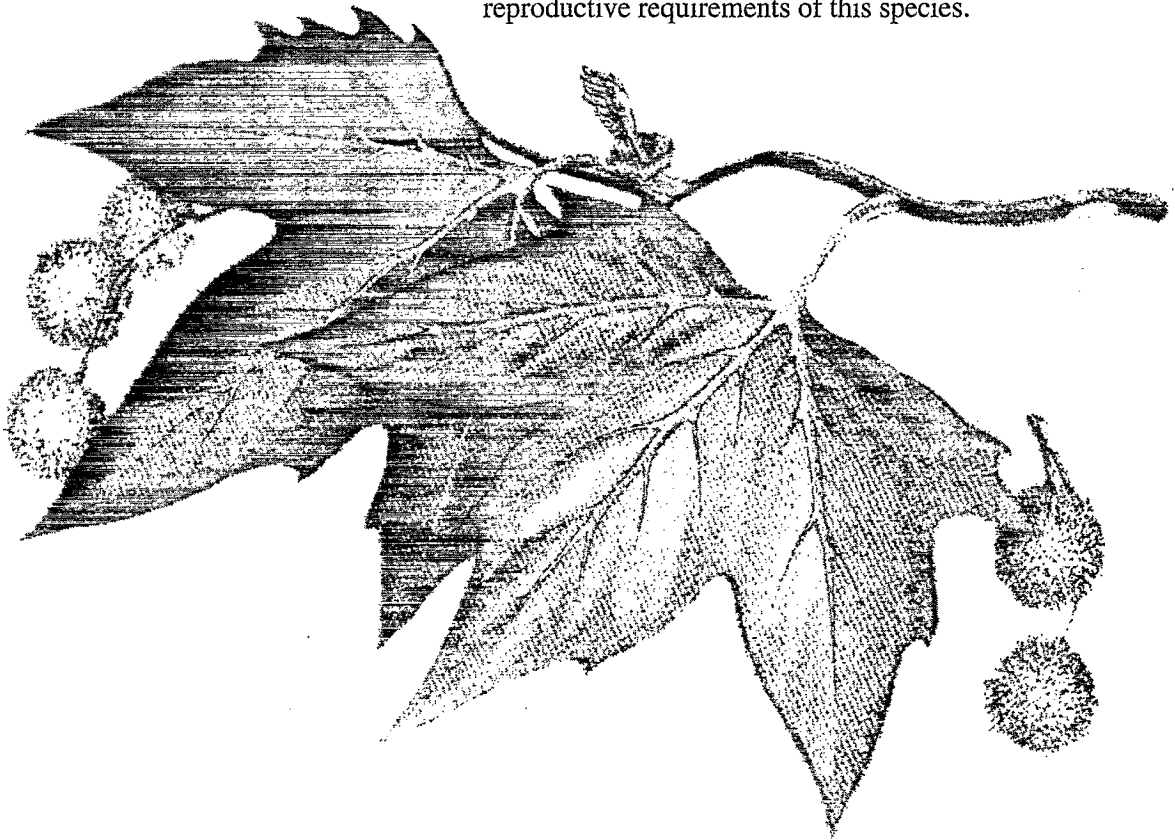
Figure A — Los Banos Grandes Facilities Location







he California Department of Water Resources (DWR) is re-evaluating the potential for building a south-of-the Delta offstream surface water storage facility. One of the alternative sites is Los Banos Grandes (LBG) located in Merced County (Figure A). The LBG project site supports a population of California sycamores (*Platanus racemosa*), which compose a significant portion of central California's remaining sycamore alluvial woodland habitat. Due to the scarcity of this habitat type, DWR has undertaken numerous studies to understand growth and reproductive requirements of this species.



# *Sycamores Pilot Program: Initial Studies*

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In 1990, DWR implemented the Sycamore Pilot Program. This project originally consisted of three major studies: the San Luis Field Division (SLFD) Sycamore Pilot Program, the Orestimba Exclusion Plot, and the Medeiros Restoration Program. These three initial studies will be followed by the Orestimba Demonstration Restoration Project, which will incorporate techniques learned through the initial investigations into test studies in a natural sycamore alluvial woodland.

## *San Luis Field Division*

The SLFD Sycamore Pilot Program consisted of a sycamore plot where different factors were tested against the survivability of the sycamore. These included water requirements, mammal browse, and weed control. In addition, growth rates were measured for different sizes of plantings.

Currently 157 sycamores are living at the plot for an overall survival rate of 55 percent. Irrigation at the plot stopped in November 1994. Many trees continue to survive without irrigation because their roots have reached the water table. As a group, the sleeves (the smallest trees planted) have the highest survival rate without irrigation. The sleeves' success in reaching the water table may be attributed to their early stage of development when planted. During this time, young trees undergo rapid root growth and may quickly outgrow their dependence on irrigation.

In February 1994, 61 trees were relocated to remove them from the line-of-sight for the San Luis Dam surveying work. Forty-three trees were planted at two perennial springs (Willow and Basalt springs) above San Luis Reservoir. Eighteen trees were relocated to an area near the SLFD offices and are being irrigated through a subsurface pipe. All the trees planted at the springs died due to the extremely dry conditions last year while the transplanted irrigated trees survived. A small seedling from the SLFD plot was transplanted to Basalt Spring in November and has survived.

## *Orestimba Exclusion Site*

At the Orestimba exclusion site, one mature sycamore was fenced at Orestimba Creek to study the impact of domestic grazing. A control tree was subjected to normal grazing cycles. While understory composition changed, the fenced sycamore did not produce any surviving sycamore shoots. The control tree has produced surviving sprouts on the outside of the property line fence within a drainage ditch. This area is not subject to grazing and receives water from road runoff.














## *Medeiros Restoration Program*

The Medeiros Restoration Program was initiated in December 1989. A combination of native trees were planted at the O'Neill Forebay to test passive irrigation techniques. Tree species planted included: sycamores, cottonwoods, arroyo and sandbar willows, valley oaks, and coyote brush. The trees have shown a very high survival rate and most of them surpassed heights of 10 feet. The high ground water table at the site facilitated the success rate of this project. Vandalism continues to be a problem but has decreased in severity as the trees grow larger.

### *Conclusions From Initial Studies*

The initial studies of the Sycamore Pilot Program have provided valuable data and experience regarding the cultivation of sycamores. Some of the conclusions are provided below:

-  For irrigated trees, sleeves had the highest growth rate while five-gallon trees had the highest survival rate.
-  Five-gallon trees do not require weeding.
-  Sycamore cuttings had a low survival rate.
-  Trees were easily grown from collected seeds and had a high survival rate.
-  In windy areas sycamores adapt by becoming shorter and bushier.
-  Deer repellent provides some protection in areas which are prone to heavy browsing.
-  Of the irrigated trees, sleeves had the highest rate reaching the water table and becoming self-reliant.
-  Depth to ground water is an important consideration at sycamore mitigation sites. A site with high ground water table is preferable since it encourages root growth.
-  The wick method of irrigation is highly successful provided a high ground water table can be maintained.
-  Trees which are periodically browsed have a higher survival rate. A low level of browsing on newly planted sycamore seedlings may reduce the shoot-to-root ratios to levels that promote long-term survival.
-  Sycamore sprouts have higher survivability where cattle have been excluded.

Detailed monitoring of these three studies concluded this year. For a more thorough discussion of these projects and the results, refer to Los Banos Grandes Facilities, Sycamore Pilot Program, Reports Numbers I, II, and III.

## *Orestimba Demonstration Restoration Project* \_\_\_\_\_

DWR is implementing a demonstration sycamore restoration project on lands purchased for mitigation at Orestimba Creek. The Orestimba project is a continuation of the Sycamore Pilot Program, expanding it into natural areas to determine the feasibility of a large-scale mitigation project involving sycamores. Sycamore propagation techniques that are suitable for large-scale application will be tested and improved



### *Project Objectives*

The purposes of the demonstration project are to test regeneration techniques in a natural setting and experiment with methods of creating additional sycamore alluvial woodland. A side benefit to the project will be improvement of degraded habitat.

The demonstration area is divided into two subareas, Plots 1A and 1B (see Figure B). Plot 1A will be subjected to various intensive management techniques to increase native plant grass and forb cover and increase sycamore density. Plot 1B will undergo passive techniques such as grazing management to test the impact it has on sycamore populations. The two sites will be compared to determine change in sycamore density, native plant percent cover, and wildlife use. A third subarea, Plot 1C (or Control Plot), will undergo normal grazing cycles.



The test plan used for this project will be flexible enough to allow habitat improvement to occur even if specific procedures do not prove successful. In other words, provisional applications are written directly into the plan to allow alternate techniques without compromising research methodologies. This study will test methodology for restoration and creation techniques that may be applicable to a large-scale mitigation project.



A map of the study area showing the California Aqueduct, Transmission Lines, Windmill, Road, Stream Channel, Plot 1A, Plot 1B, and Plot 1C. The map includes a legend for the symbols used.

Legend:

- California Aqueduct
- Transmission Lines
- Windmill
- Road
- Stream Channel
- Plot 1A
- Plot 1B
- Plot 1C

California Aqueduct

Road

Plot 1C

Stream Channel

Existing Sycamores

Existing Cottonwood

Existing Willow

Scale 300'

N

# Existing Conditions

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## Site Description

DWR owns approximately 1,734 acres on lower Orestimba Creek. About 1,500 acres are currently leased for cattle grazing while the remainder is leased for agriculture.

The demonstration site consists of 128 acres of intensively grazed land. The plot will be divided into two sections, Plot 1A and Plot 1B, composed of 102 acres and 27 acres respectively. Plot 1A is more degraded than Plot 1B and the overall density of sycamores is lower.

An area to the east of the plots will serve as the Control Plot. The control site will consist of 16 acres located on the east side of the California aqueduct (see Figure C). This site was chosen due to its lack of disturbance other than grazing and its relative proximity to Plots 1A and 1B. This site will undergo normal grazing cycles. Normal grazing cycles vary from 90 to 240 days per year with 1 cow per 3-4 acres. This site has been surveyed and will be monitored as described for Plots 1A and 1B.

## Hydrology

Orestimba Creek is an intermittent drainage with its headwaters in the Diablo Range. The creek flows west to east, from the eastern slopes of the Diablo Range to the San Joaquin Valley floor in western Stanislaus County. Average runoff for a 57-year period from 1931 to 1987 was 17 cubic feet per second or 12,320 acre-feet per year. The plot location is mapped on the USGS Orestimba Peak Quadrangle and is located 15 miles north of Santa Nella at an elevation of approximately 260 feet. Rainfall averages 10.5 inches per year.

## Vegetation

Plot 1A is mostly composed of nonnative grassland and a combination of native and nonnative forbs. Old channels on the south side of the plot are completely vegetated and flow only during very high water events. The active stream channels support native tree species such as cottonwood and willow as well as nonnative species such as tobacco tree and tamarisk. There are scattered shrub species and an understory mixture of wetland and upland plants. Appendix A provides a list of vegetation recorded in transects for both plots.

Sycamores occur on the benches above the stream channel. The sycamores in Plot 1B are concentrated while the sycamores in Plot 1A are fairly sparse. Grazing was temporarily halted on both plots on March 13, 1995, to encourage vegetation growth for plant identification, seed collection, and to supply fuel for the controlled burn. Grazing will be utilized as a vegetation management tool; discussion of this is provided later in this text.

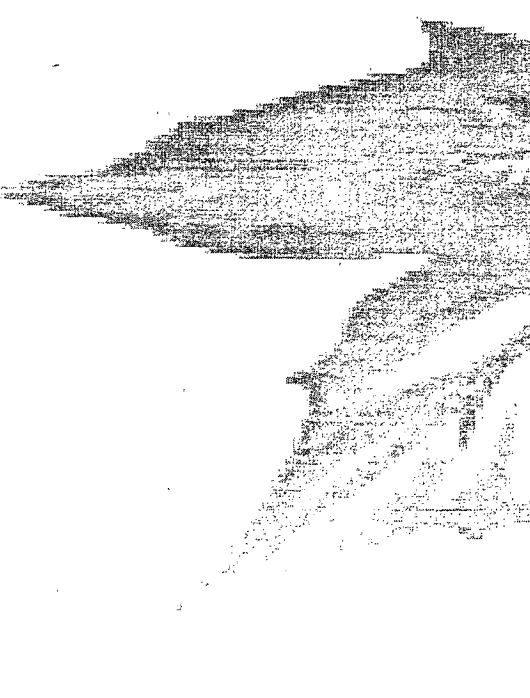
## *Wildlife*

Orestimba Canyon supports a wide diversity of native wildlife including amphibians, reptiles, birds, and mammals. Surveys will be conducted before and during restoration treatments to determine inhabitants within the plots. Appendix B provides a complete list of potential and existing wildlife.

## *Archaeology*

In 1992, the Department of Parks and Recreation conducted detailed archaeology surveys at Orestimba Creek. One archaeological site occurs with the mitigation plot boundaries. Site ORE-45 is an early- to mid-twentieth century ranch habitation and possible water-storage site. It is located on an upland terrace immediately adjacent to the creekbed of Orestimba Creek in the southeast corner of Plot 1A (see Figure D).

ORE-45 is not considered eligible for nomination to the National Register of Historic Places due to its lack of significance as a historical feature. The restoration project will not have any significant impact on this site.



The site consists of five concrete tanks and covers set into the ground. Only 1-inch of the box and its lid are above ground. Each approximately 7-foot-by-5-foot box has a lid with six pieces of iron strap set into it that may have been used to lift it. Some boxes have several links of chain hanging from an iron ring.

There are two ditch segments at this site. One is located at the north edge of the terrace and connects two of the concrete tanks; the other segment runs northeast of the first segment and appears to have been a continuation of it at one time. The second segment connects another set of the concrete tanks.

A sparse scattering of artifacts was also found at the site including bricks, soldered pipe, broken concrete, 1-inch-wide barrel hoops, a zinc-coated bucket, small bundles of wire, unidentified metal scraps, a small slotted metal panel, small wooden stakes, amethyst glass bottle fragment, a metal spring, and a clear glass vaccination bottle.

Figure D. First Year

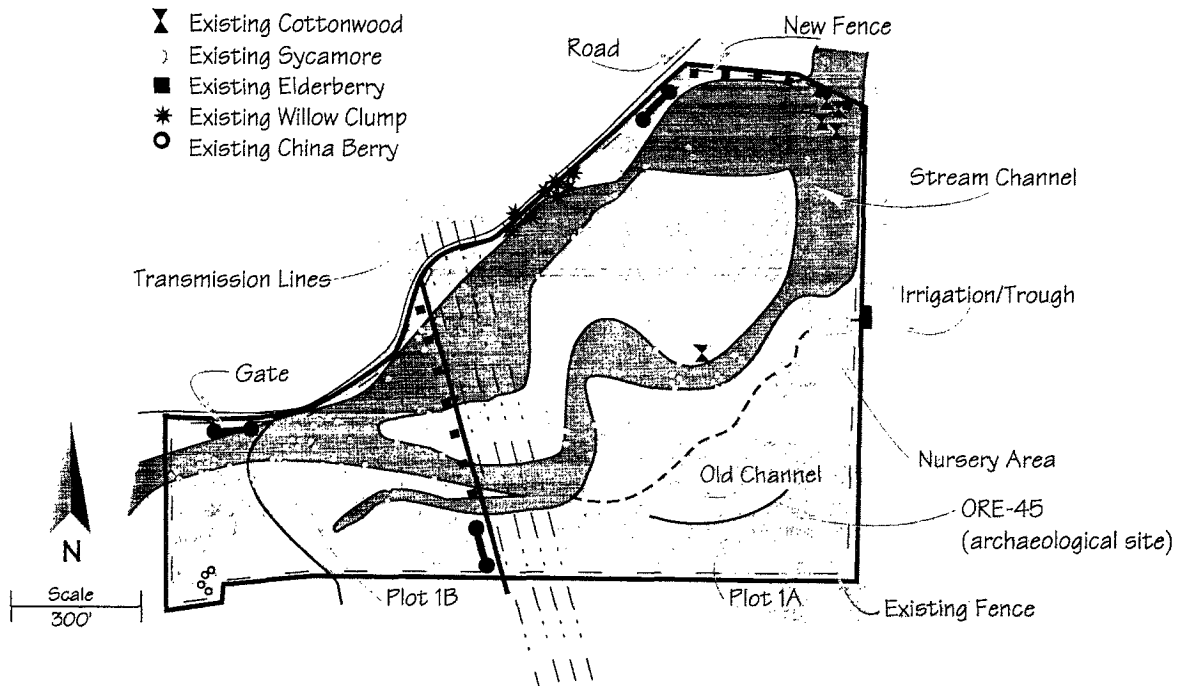
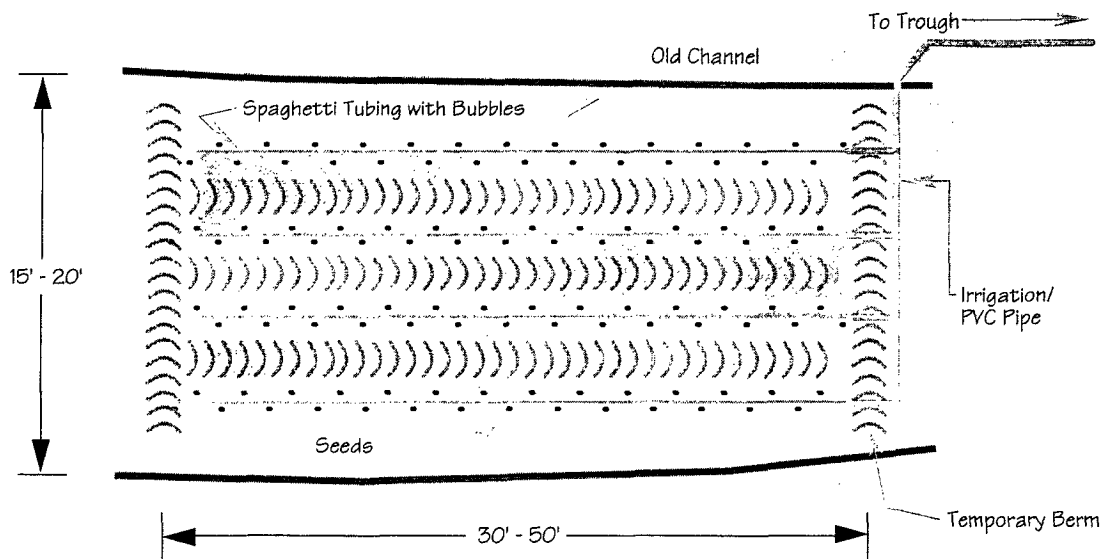


Figure E. Nursery





## *Treatments*

Plots 1A, 1B, and 1C (the Control Plot) were surveyed for plants, wildlife, sycamore size and density, and archeological sites.

The treatments for 1A will include controlled grazing, burning of the area outside the stream bed, designing and planting an on-site sycamore nursery, native forb seeding, irrigation, and sycamore seedling plantings.

Plot 1B will undergo a controlled burn the first year and managed grazing for the life of the project.

Plot 1C will be managed with normal grazing cycles. No treatments will be utilized in this plot.

## *Survey Methodology*

Vegetation transects are being used to quantify and qualify the type and percent cover of plant species. Transect locations were selected using a random numbers table. The random number generated in each case represented the number of meters from the west side of the power lines (which separates the two plots) to the transect position. A half-meter-square quadrat was placed every 15 meters along both transects and a relative percent cover was estimated for each plant species, rock, bare ground, litter, and water that was present. Native plant species occurring near, but not within, the quadrats were also noted as were general observations. Transects will be conducted on an annual basis in the spring. The first transects were conducted on March 2 and 3, 1995. Transects were conducted on the Control Plot on July 24, 1995. In future years, vegetation transects will be conducted in late spring. This year, ongoing general vegetation surveys are being conducted at all three locations to verify similarity between plots.

Diameter at breast height (DBH) surveys are being conducted to determine the number and size of the sycamores before and after the project. Each tree was located in the field and numbered on an aerial photograph. Stems were considered to be single branches unless the branches were within 5 to 6 feet of each other and appeared to arise from a common crown. Presence of rotted stumps or sprouts between two adjacent stems was taken as evidence for a common crown for the two stems. Branch diameters were measured at approximately 4.0 to 4.5 feet from the ground using a DBH measuring tape. The height of the measurement was adjusted to avoid branch junctions or damaged stems. Basal sprouts with diameters less than 1.5 centimeters were counted for each tree.



Anthracnose damage was evaluated for each tree based on the presence of abnormal twig growth. Damage was rated "heavy" if more than half the tree canopy was affected, "moderate" if more than one-fourth of the canopy was affected, and "light" if less than one-fourth of the canopy was affected.

Stem damage was evaluated for each tree based on the presence of dead wood, hollow stems, or rotted wood. Damage was rated "heavy" if stems had visible damaged areas more than 12 inches wide, "moderate" if damage was 6-12 inches wide, or "light" if damage was less than 6 inches wide. The average number of stems per tree, number of stems in various size classes, and average number of sprouts per tree were determined for the tree population. This data is summarized in Table 1 and Graphs 1-4.

Wildlife surveys will be conducted on an annual basis to determine what species occur on site and whether any change to species composition occurs during the life of the project. Wildlife surveys will consist of a search of available records through the California Natural Diversity Data Base for known locations of sensitive species augmented by available literature for non-sensitive species. Any species known to be in the geographic area within the habitat type will be listed on a potential species list. Ground truthing will occur utilizing techniques suitable for the targeted vertebrate species.

Amphibians and reptiles will be surveyed by direct observation of the area. Species will be observed and recorded on data sheets. A diurnal walking transect of the area will be conducted when temperatures are between 75 and 95 degrees Fahrenheit to allow for optimum reptile activity. Leaf litter and rotting logs will also be searched for less active amphibians and reptiles. A night search of roadways and watercourses will be initiated using spotlights to supplement the walking transects. Three consecutive night searches will be conducted.

Birds will be surveyed by direct observation at dawn and dusk. Species will be identified by distinguishing characteristics and noted on data sheets.

Mammals will be surveyed by direct observation and live-trapping. Any mammal observed during transects for birds and reptiles will be noted on data sheets. Small mammals will be sampled by live trapping. All species trapped will be identified to species, recorded on data sheets, and released where trapped unharmed. For a list of actual and potential species occurrences see Appendix B.

### *Weed Control*

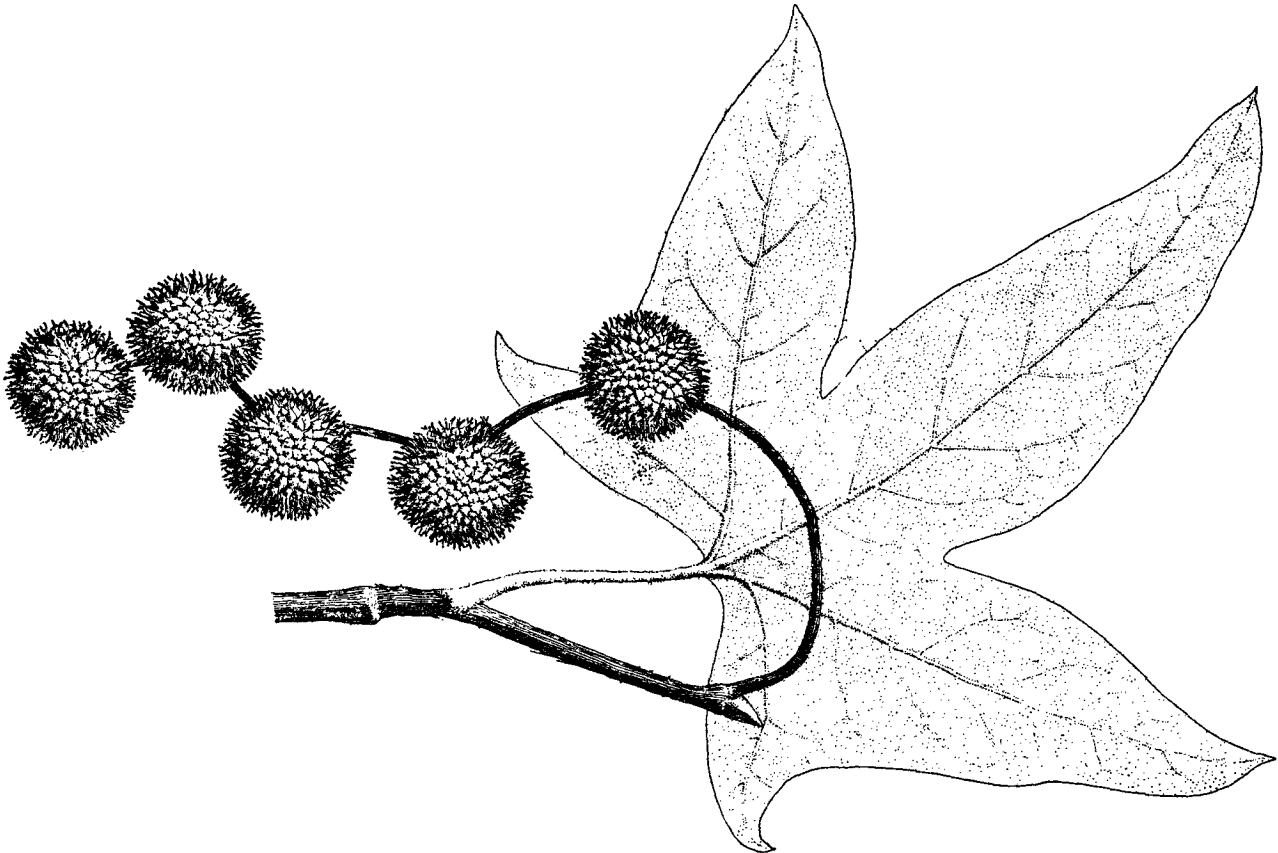
Portions of Plots 1A and 1B were burned by the California Department of Forestry and Fire Protection on July 14, 1995. Burning occurred before the nonnative grass set seed to reduce the current and future percentage cover of these species. Fallen logs and debris below the

TABLE 1

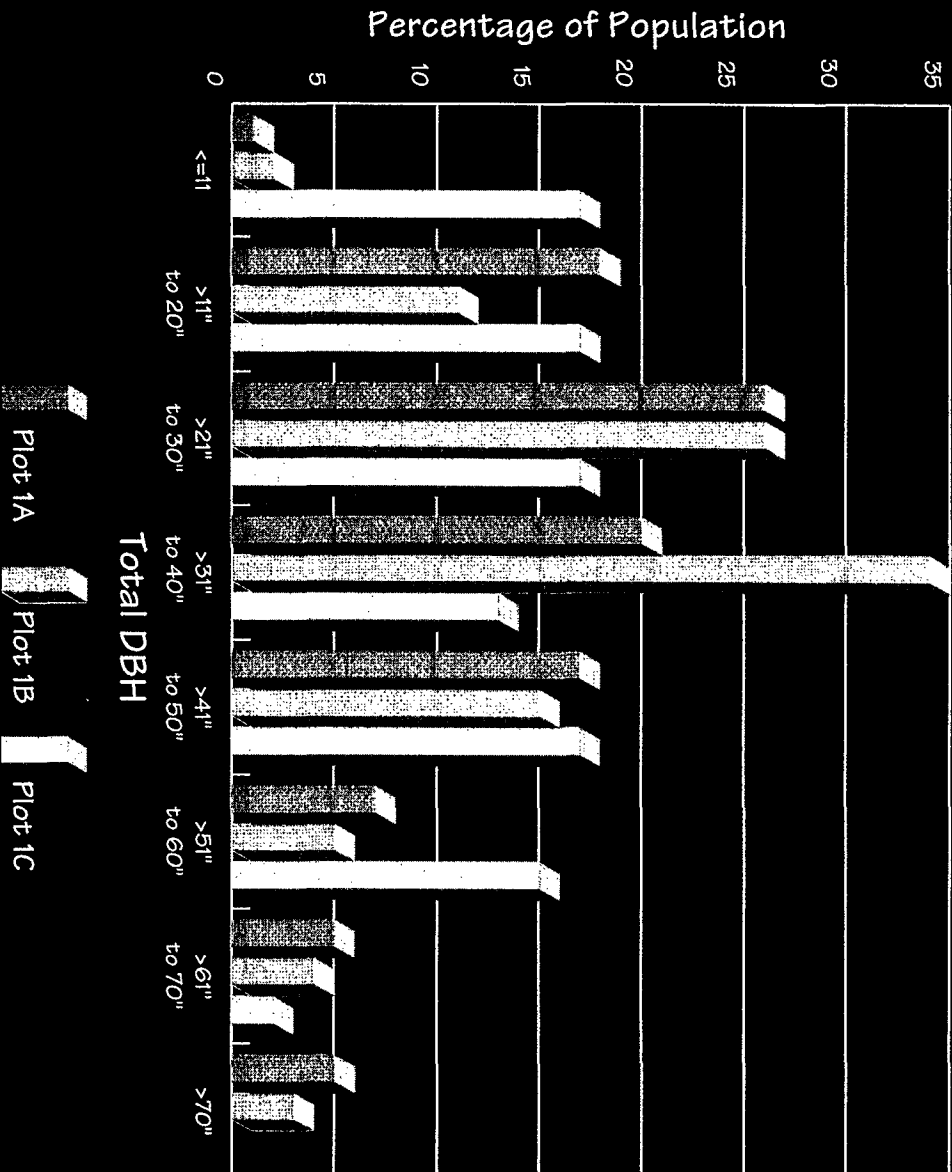
TREES FOUND AT ORESTIMBA DEMONSTRATION RESTORATION PROJECT					
Plot	Sycamores	Willows	Poplars	Others	Total
Plot 1A	98	17	6	1	122
Plot 1B	131	0	0	3	134
Plot 1C	52	4	1	0	57
Total	281	21	7	4	313

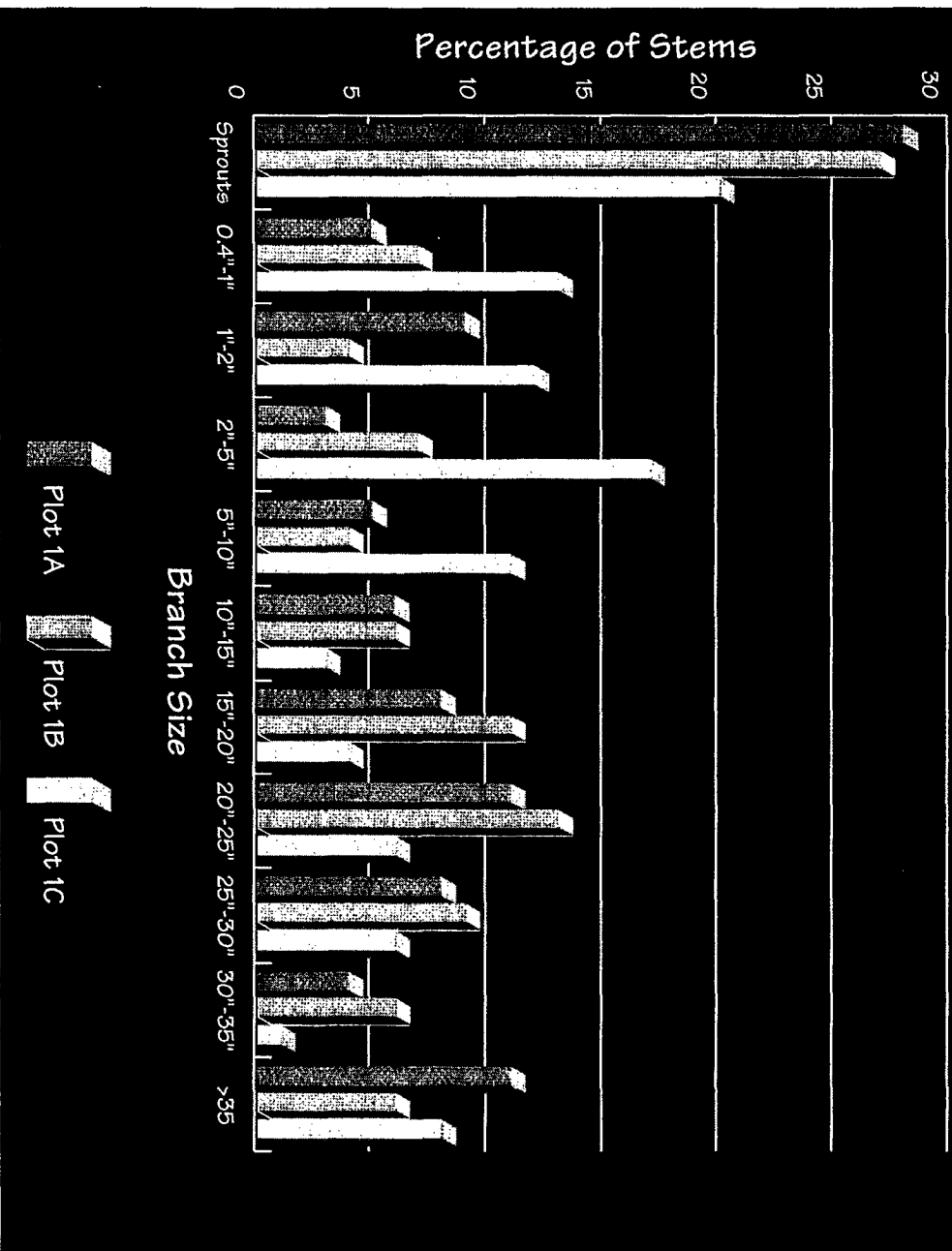
TREE SPECIES PERCENTAGES FOUND AT ORESTIMBA DEMONSTRATION RESTORATION PROJECT					
Plot	Sycamores	Willows	Poplars	Others	Total
Plot 1A	80%	14%	5%	1%	100%
Plot 1B	98%	0%	0%	2%	100%
Plot 1C	91%	7%	2%	0%	100%
Total	90%	7%	2%	1%	100%



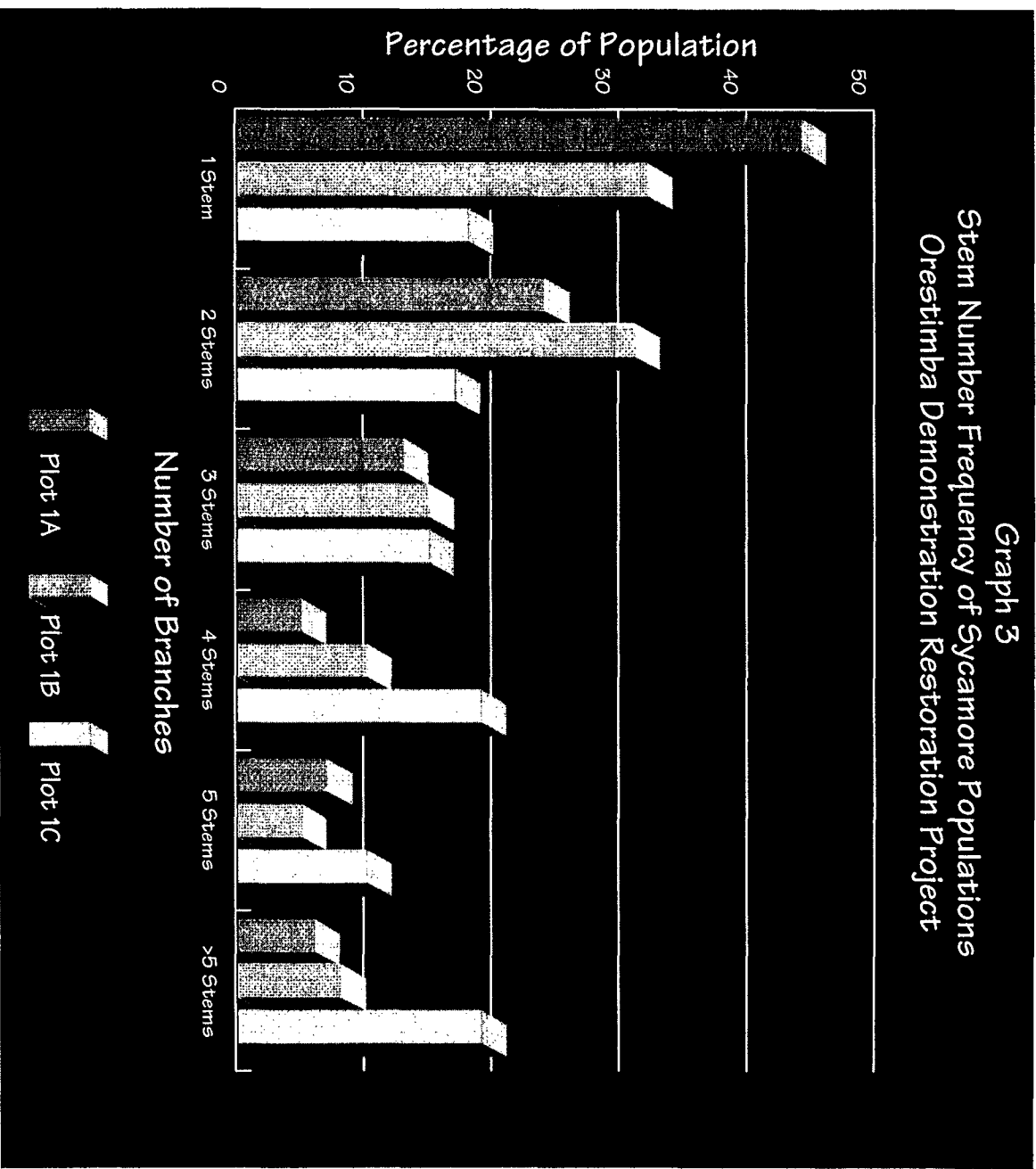
Graph 1  
Relative Frequency of Sycamore Total DBH Sizes  
Orestimba Demonstration Restoration Project



Graph 2  
Frequency of Branch Sizes Among Sycamore Populations  
Orestimba Demonstration Restoration Project

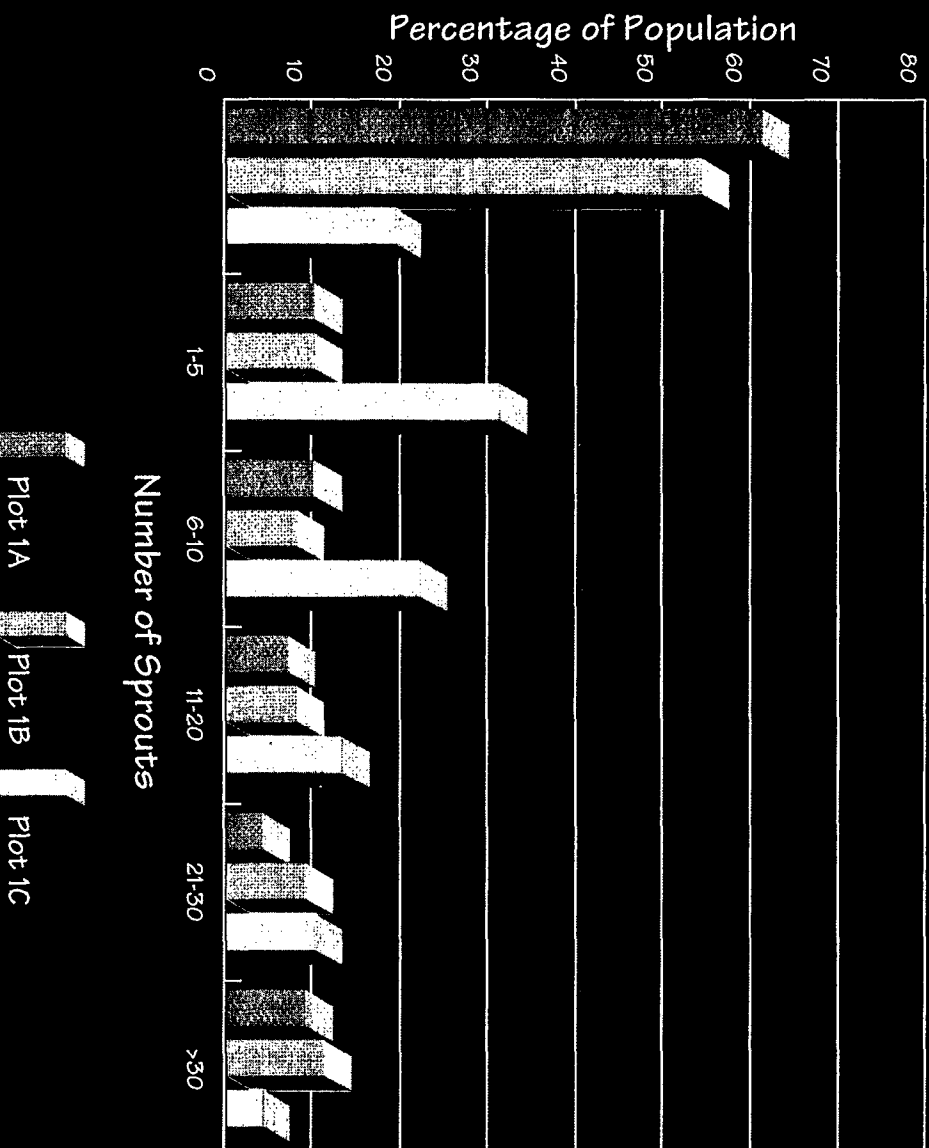


Graph 3  
Stem Number Frequency of Sycamore Populations  
Orestimba Demonstration Restoration Project





Graph 4  
Sprout Number Frequency  
Orestimba Demonstration Restoration Project



trees were removed to prevent fire spreading to living tree crowns. The burn occurred after several days of no rain, when the grass was burnable, and when it was deemed suitable by the Air Resources Board. Burning times are restricted by air quality and wind speed. The fire was started from the perimeter of the site and no vehicles were allowed to access the interior of the site. An environmental monitor and wildlife biologist were present to survey the area prior to the burn. Plot 1A will be burned again next year.

Nonnative shrub and tree species that occur in the stream channels will be hand-grubbed if necessary. Some of the nonnative vegetation plants were removed by the high-water flow that occurred this year.

### *Sycamore Plantings*

During January and March 1995, sycamore seeds were collected from many sycamores downstream and within the project site. Seeds will be extracted from the seedballs. Half of the seeds will be stored in a cool, dry place and will be soaked overnight immediately before planting. The remaining half will be stratified by soaking the seeds overnight and storing them at 32-41 degrees Fahrenheit for approximately 3 months.

A sycamore nursery will be established on site in the southeast corner of Plot 1A. This location has a wide, gently sloping, old stream bed that is suitable for sycamore propagation. It is also relatively close to the water source. The nursery will be approximately 20 feet by 40 feet (see Figure E). The area will be rototilled and raked to prepare the seedbed. The soil topography of the plot will be formed into small furrows. Small berms will be constructed on the linear perimeter of the plot. Half of the nursery will be planted with stratified seeds and the remaining half planted with nonstratified seeds. Bubbler irrigation will begin immediately after seeding and will be flooded twice a week for the first 6 months. During establishment, the plot will be monitored closely for sprouting, browse, and weed problems. Any remedial modifications will be carefully documented.

Sycamore seedlings will be transplanted before they reach 12 inches in height, within the second year of the project. The sycamores will be removed from the nursery and transplanted above and along the banks of the old channel.

After transplanting, each sycamore planting may be protected with the collar and screen as developed by PG&E (see Figure F) if deemed necessary. The collar will protect both the above- and below-ground portion of the plant from mammal and insect predation. The collar also serves to increase soil temperatures to encourage earlier germination and growth and concentrate water in the root zone to promote deep rooting.

Figure F. Planting Detail & Browse Protection for Container Plantings

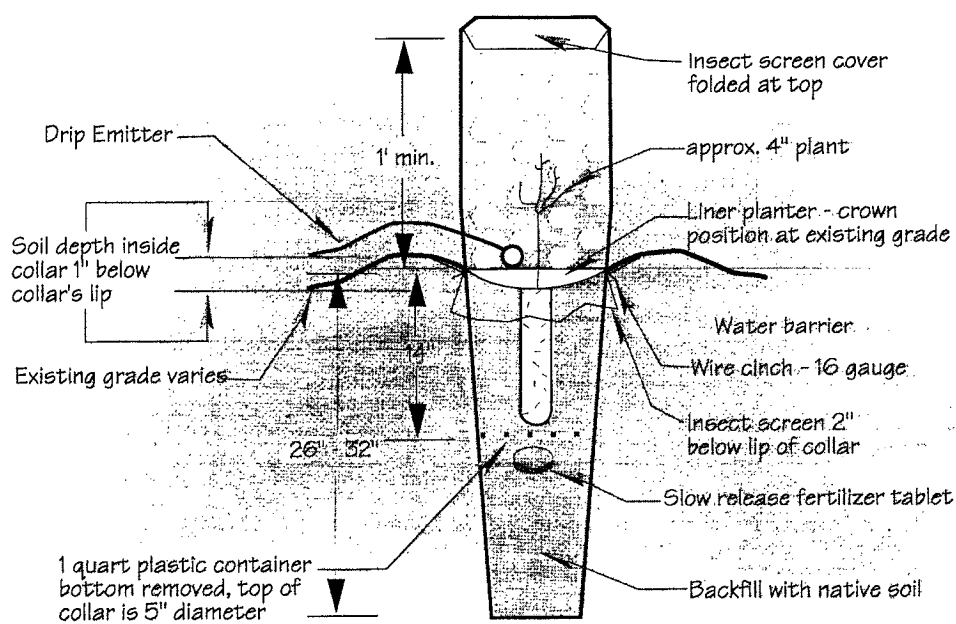
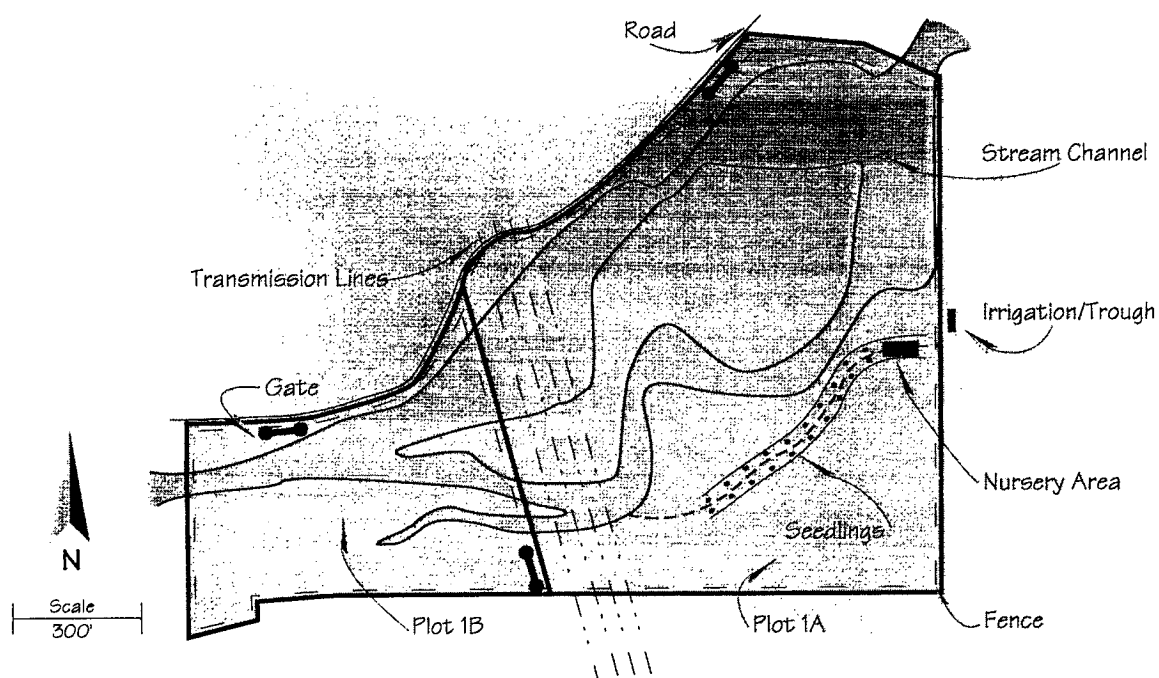


Figure G. Second Year



During the second year, the irrigation system will be modified and all sycamores will continue to receive water. The irrigation piping will be split into two lines and extended along the banks of the old drainage. A drip emitter will be placed at each seedling. Planted sycamore seedlings will be irrigated approximately once every week in summer and fall, or whenever rainfall has been less than 1 inch in the previous 2 weeks. When watering, the soil shall be saturated to a depth of at least 2 inches below the roots of the planted vegetation. It is estimated that each sycamore will receive approximately one-half gallon for 10 hours, once a week. Irrigation amount and length of time will be adjusted if necessary as determined by tree vigor.

Water will be obtained from an existing domestic well, pump, and trough that are located on an adjacent parcel owned by DWR. During the first year, 1-inch-diameter PVC pipe will be connected to the pipe which supplies the trough and run approximately 450 feet to the nursery location (see Figure D). After the seedlings are transplanted, the pipe will be run on the surface in two lines along the drainage for a total of approximately 5,250 feet (see Figure G). It will not be necessary for the irrigation system to cross any active drainages.

If the pump fails to provide water in any given year, water will be pumped from the California aqueduct using a portable pump, stored in a tank, and piped to the sycamores using the proposed irrigation system.

### *Upland Planting*

The site will be surveyed to determine whether there are viable seeds and when they should be collected. Supervised California Conservation Corps members will collect the seeds and remove large weeds (such as tobacco tree and tamarisk) from the stream bed.

Seeds may be purchased from a commercial nursery provided they are from suitable (area specific) genetic stock. Herbaceous and grass species will be chosen for planting in the upland area of the plot. Their selection will depend on whether they are native to the site, specific habitat type, commercial availability, seed source availability, ability to colonize and compete, drought tolerance, forage desirability, and cost. Species under consideration include native perennial and annual grasses and forbs.

Seed will be applied to trial areas within plot 1A during the third year of the study by hand or with a native seed range drill on scarified ground at a rate suitable to the species. Legume seed shall be pellet-inoculated with a viable bacteria compatible for use with that species of seed. Straw will be applied over the entire surface of the seeded area. Seeds may be watered with a water truck utilizing a central travel corridor. Irrigation will not be applied again unless it is determined to be necessary.

Figure H. Location of Photo Shots - Plots 1A and 1B

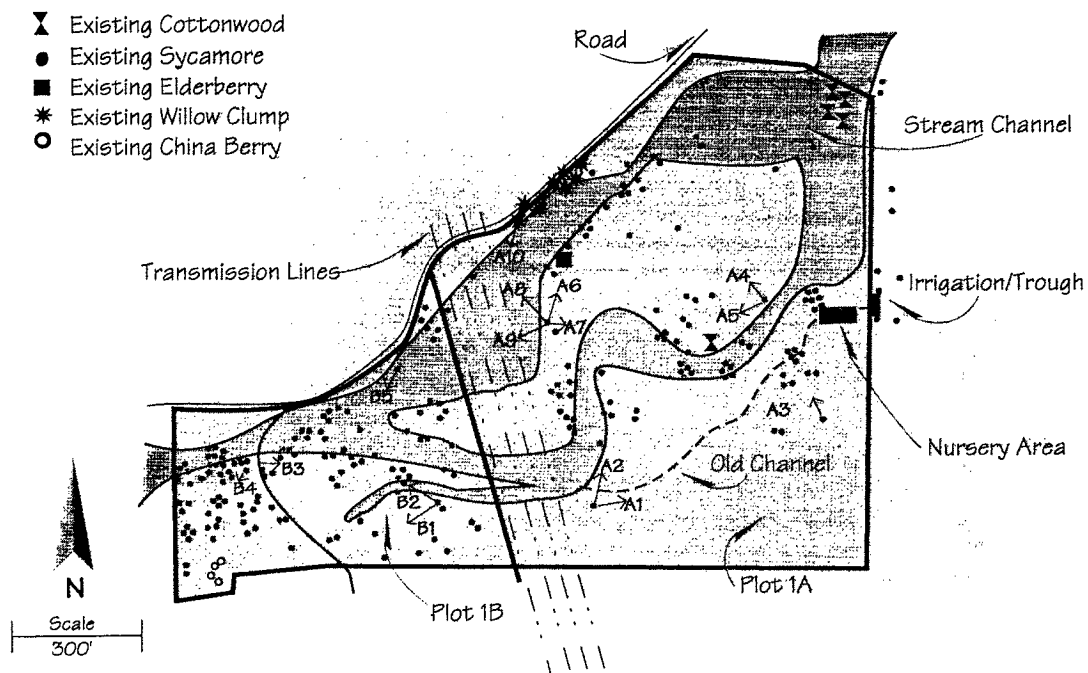
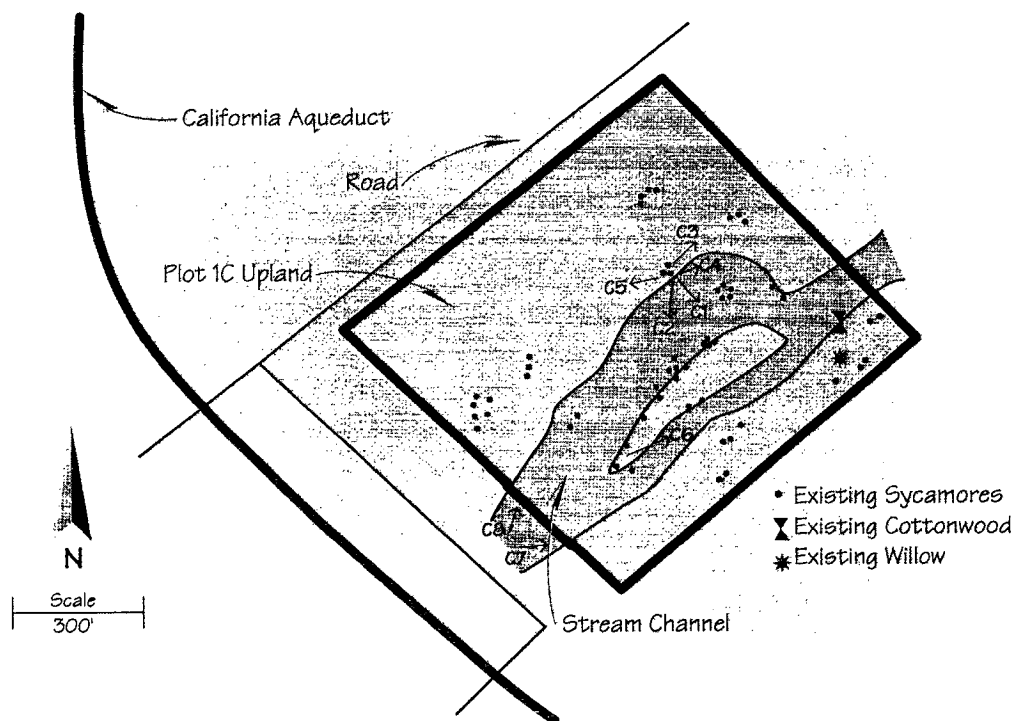


Figure I. Location of Photo Shots - Plot 1C



## *Managed Grazing*

For the first year, grazing cattle will be allowed on Plot 1B only and will utilize the Holistic Management Technique. This practice involves grazing management to benefit native plants and provide inhospitable condition for weedy plants. Grazing will be allowed on site 1A after 3 years or when sycamore seedlings and sprouts are at a size able to withstand grazing.

It is expected that with managed grazing, sycamore sprouting will occur and passively increase sycamore density in the plots. Sycamore sprouting will be monitored to determine any increase in the population.

The existing fence will be repaired and replaced where necessary. A new fence will be installed between Plots 1A and 1B, and along the perimeter of a portion of 1A that is not currently fenced. The primary purpose of the fence is to control cattle grazing. Fence material will be composed of a four-strand barbed wire. There will be three gates to facilitate cattle movement and break-away features where the fence crosses the stream channel to avoid damage during times of high flow.

Numerous sycamores on site are being girdled by old barbed wire fencing. During installation of the fence, all remnant material will be removed.

## *Environmental Compliance*

Coordination with the California Department of Fish and Game has been initiated and will continue for the life of the project. The Department will comply with CEQA and any concerned regulatory agencies will be notified and invited to participate if interested.

## *Maintenance and Monitoring*

Initially the site will be monitored on a monthly basis. General monitoring will check the irrigation system, fencing, grazing impacts, and potential problems. Photographic documentation will be taken at 24 stationary locations within the three plots once a year for 5 years (see Figures H and I). Vegetation transects will be conducted on a yearly basis. Sycamore DBH measurements will be taken the first year and the fourth year. Sycamore sprouting data will be taken annually to determine whether density is increasing. The sycamore seedlings will be monitored on a monthly basis for the first year and biannually the following 2 years. Sycamore seedling height and growth rate will be measured and recorded. Wildlife monitoring will occur in spring on an annual basis to determine whether there has been any general change in usage.



If native herbaceous strata is less than 50 percent in Plot 1A after the fourth year, additional native plant seeding will be undertaken. The seed mix may be modified to test other species but will use the same criteria of the first mix.



Sycamore seeds will be collected on an annual basis in the event that those collected the first year do not propagate. If no seedlings have sprouted by the second year, seeds will be collected and sent to a reputable nursery to determine if they are viable. If these tests are positive, seeds will be sent to a commercial nursery for propagation and grown to container size. These seedlings will then be transplanted in Plot 1A during the third year as outlined in the second year plan.

Any basal sprouting of existing sycamores or volunteer seed reproduction will be monitored. If sycamore sprouts are still being masticated in Plot 1B, grazing practices will be modified in an attempt to encourage sprout survival.

Procedures are divided as to the year when they occur. The first year runs from March 1, 1995, to February 29, 1996. The subsequent years follow the same time interval.

Reports will be written on an annual basis to document the progress of this project.

## *One-Year Plan - Plot IA*

- sycamore seed collection
- controlled burn
- grass and herbaceous seed collection
- nursery established
- clearing and grubbing stream channel (nonnative shrubs)
- fencing installed
- collect shrub and herbaceous seeds
- irrigation installed
- initial surveys
- permits

## *Two-Year Plan - Plot IA*

- controlled burn
- seedlings planted
- irrigation modification
- seeding upland area
- monitoring
- remedial measures

## *Three-to Five-Year Plan - Plot IA*

- managed grazing
- monitoring
- remedial measures

## *One-Year Plan - Plot IB*

- managed grazing
- controlled burn
- monitoring

## *Two-Year Plan - Plot IB*

- managed grazing
- monitoring

## *Three-to Five-Year Plan - Plot IB*

- managed grazing
- monitoring
- remedial measures

# APPENDIX A

SPECIES LIST OF VEGETATION AT ORESTIMA DEMONSTRATION RESTORATION PROJECT		
	DICOTS	
Scientific Name	Common Name	Plot locations
ASCLEPIADACEAE FAMILY		
<i>Asclepias fascicularis</i>	Milkweed	1A, 1C
ASTERACEAE FAMILY		
<i>Artemisia</i> sp.	Sagebrush	1C
<i>Baccharis salicifolia</i>	Mule fat	1A
<i>Calycadenia truncata</i>	Rosin weed	1A, 1C
<i>Centaurea melitensis</i>	Tocalote	1A, 1B, 1C
<i>Gnaphalium palustre</i>	Cudweed, everlasting	1A, 1C
<i>Helianthus annuus</i>	Sunflower	1C
<i>Hemizonia pungens</i>	Common spikeweed	1A, 1B, 1C
<i>Heterotheca</i> sp.	Telegraph weed	1C
<i>Senecio vulgaris</i>	Common groundsel	1B
BORAGINACEAE FAMILY		
<i>Amsinckia menziesii</i> var <i>intermedia</i>	Common fiddleneck	1A
<i>Heliotropium curassavicum</i>	Heliotrope	1A, 1B, 1C
<i>Plagiobothrys</i> sp.	Popcorn flower	1A, 1B, 1C
<i>Xanthium</i> sp.	Cocklebur	1C
BRASSICACEAE FAMILY		
<i>Athysanus pusillus</i>		1B
<i>Brassica nigra</i>	Black mustard	1A, 1C
CARYOPHYLLACEAE FAMILY		
<i>Arenaria</i> sp.	Sandwort	1C
<i>Stellaria media</i>	Common chickweed	1A, 1B, 1C
CHENOPODIACEAE FAMILY		
<i>Chenopodium ambrosioides</i>	Mexican tea	1C
CONVOLVULACEAE FAMILY		
<i>Convolvulus arvensis</i>	Bindweed	1A
CRASSULACEAE FAMILY		
<i>Crassula connata</i>	Pygmy-weed	1A, 1B
EUPHORBIACEAE FAMILY		
<i>Eremocarpus setigerus</i>	Dove weed	1A, 1B, 1C
FABACEAE FAMILY		

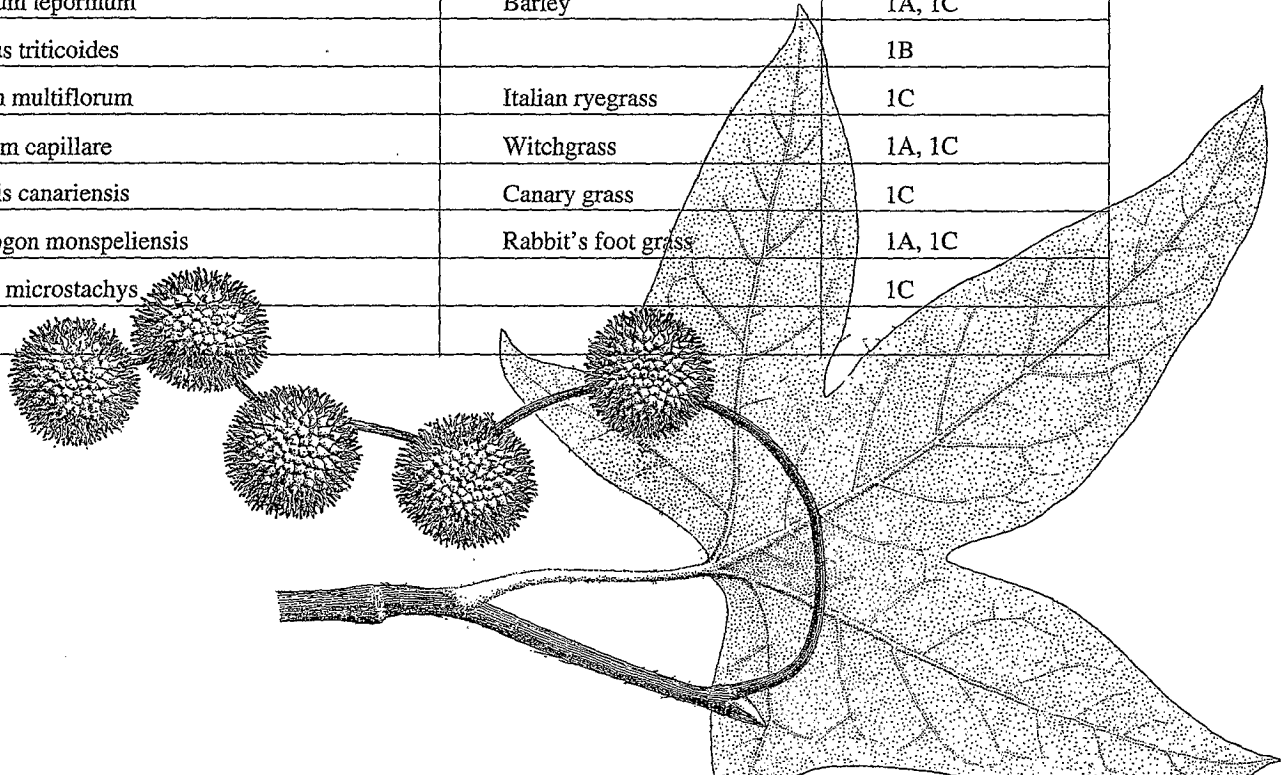
# APPENDIX A

SPECIES LIST OF VEGETATION AT ORESTIMBA DEMONSTRATION RESTORATION PROJECT, <i>continued</i>		
Scientific Name	Common Name	Plot Locations
<i>Lotus corniculatus</i>	Birdsfoot trefoil	1A
<i>Lotus purshianus</i>	Spanish clover	1A, 1C
<i>Lupinus</i> sp		1A
<i>Medicago polymorpha</i>	California burclover	1A, 1B
<i>Melilotus indica</i>	Sourclover	1A, 1B, 1C
GENTIANACEAE		
<i>Centaurium venustum</i>	Canchalagua	1A, 1C
GERANIACEAE FAMILY		
<i>Erodium botrys</i>	Storksbill, filaree	1A, 1B
<i>Erodium cicutarium</i>	Red-stemmed filaree	1A, 1B
<i>Erodium moschatum</i>	Storksbill, filaree	1A, 1B, 1C
LAMIACEAE FAMIL		
<i>Lamium amplexicaule</i>	Dead nettle	1B
<i>Marrubium vulgare</i>	Horehound	1C
<i>Stachys albens</i>	Hedge nettle	1A
<i>Trichostema lanceolatum</i>	Vinegar weed	1A, 1C
LYTHRACEAE		
<i>Lythrum hyssopifolium</i>	Loosestrife	1A, 1C
ONAGRACEAE		
<i>Epilobium densiflorum</i>	Fireweed	1A
POLEMONIACEAE FAMILY		
<i>Gilia tricolor</i>	Bird's eyes	1B
POLYGONACEAE FAMILY		
<i>Rumex crispus</i>	Curly dock	1A, 1C
PORTULACACEAE FAMILY		
<i>Calandrinia ciliata</i>	Red maids	1A, 1B, 1C
<i>Claytonia perfoliata</i> ssp. <i>perfoliata</i>	Miner's lettuce	1A
PRIMULACEAE FAMILY		
<i>Anagallis arvensis</i>	Scarlet pimperne	1 1A, 1C
SCROPHULARIACEAE FAMILY		
<i>Mimulus cardinalis</i>	Monkey flower	1A
<i>Mimulus guttatus</i>		1A
<i>Mimulus pilosus</i>		1A, 1C

# APPENDIX A

## SPECIES LIST OF VEGETATION AT ORESTIMBA DEMONSTRATION RESTORATION PROJECT, *continued*

Scientific Name	Common Name	Plot Locations
Veronica persica	Persian speedwell	1A
SOLANACEAE FAMILY		
Datura sp.	Jimson weed	1A, 1C
Nicotiana quadrivalvis	Tobacco plant	1A, 1C
URTICACEAE FAMILY		
Urtica sp.	Stinging nettle	1A, 1B
MONOCOTS		
CYPERACEAE		
Cyperus eragostis	Nutsedge	1A
Eleocharis macrostachya	Spikerush	1A
Scirpus americanus	Bulrush	1A
JUNCACEAE		
Juncus bufonius	Rush grass	1C
Juncus xiphioides	Rush grass	1A
POACEAE FAMILY		
Bromus hordeaceus	Soft chess	1A, 1B, 1C
Bromus rubens	Red brome	1C
Bromus sp.		1A, 1B
Crypsis schoenoides	Prickle grass	1A, 1C
Cynodon dactylon	Bermuda grass	1C
Hordeum leporinum	Barley	1A, 1C
Leymus triticoides		1B
Lolium multiflorum	Italian ryegrass	1C
Panicum capillare	Witchgrass	1A, 1C
Phalaris canariensis	Canary grass	1C
Polypogon monspeliensis	Rabbit's foot grass	1A, 1C
Vulpia microstachys		1C



## APPENDIX B

WILDLIFE SPECIES OBSERVED AT ORESTIMBA CREEK DEMONSTRATION RESTORATION PROJECT			
	Common Name	Scientific Name	Plot Locations
<b>AMPHIBIA</b>			
ANURA			
Bufonidae			
	Western Toad	<i>Bufo boreas</i>	1A, 1B, 1C
<b>REPTILIA</b>			
SQUAMATA			
Iguanidae			
	Western Spiny Lizard	<i>Sclerophorus coronatus</i>	1A, 1B
	Common Garter Snake	<i>Thamnophis sirtalis</i>	
Viperidae			
	Western Rattlesnake	<i>Crotalus viridis</i>	
<b>MAMMALIA</b>			
CARNIVORA			
Canidae			
	Coyote	<i>Canis latrans</i>	1A, 1B
	Bobcat	<i>Lynx rufus</i>	
ARTIODACTYLA			
Bovidae	Cattle	<i>Bos taurus</i>	1A, 1B, 1C
RODENTIA			
Sciuridae			
California Ground Squirrel		<i>Spermophilus beecheyi</i>	1A, 1B, 1C
Cricetidae			
	Deer Mouse	<i>Peromyscus maniculatus</i>	1C
LAGOMORPHA			
Leporidae			
	Black-tailed Jackrabbit	<i>Lepus californicus</i>	1A, 1B, 1C
	Audobon's Cottontail	<i>Sylvilagus audubonii</i>	1A, 1B, 1C

Birds observed are considered to be present in all three plots, due to the mobility of birds and the close proximity of the plots (AVES - listed on the two following pages).



# APPENDIX B

continued

WILDLIFE SPECIES OBSERVED AT ORESTIMBA CREEK DEMONSTRATION RESTORATION PROJECT			
	Common Name	Scientific Name	Plot Locations
<b>AVES</b>			
<b>CICONIFORMES</b>			
Ardeidae			
	Snowy Egret	<i>Egretta thula</i>	
	Great Blue Heron	<i>Ardea herodias</i>	
<b>ANSERIFORMES</b>			
Anatidae			
"dabbling ducks"			
	Mallard	<i>Anas platyrhynchos</i>	
	Northern Pintail	<i>Anas acuta</i>	
<b>GRUIFORMES</b>			
Recurvirostridae			
	American Avocet	<i>Recurvirostra americana</i>	
Charadriidae			
	Killdeer	<i>Charadrius vociferus</i>	
<b>FALCONIFORMES</b>			
Cathartidae			
	Turkey Vulture	<i>Cathartes aura</i>	
Accipiteridae			
	Golden Eagle	<i>Aquila chrysaetos</i>	
	Red-tailed Hawk	<i>Buteo jamacensis</i>	
	American Kestrel	<i>Falco sparverius</i>	
	Prairie Falcon	<i>Falco mexicanus</i>	
<b>COLUMBIFORMES</b>			
Phasianidae			
	Rock Dove	<i>Columba livia</i>	
	Mourning Dove	<i>Zenaida macroura</i>	

# APPENDIX B

continued

WILDLIFE SPECIES OBSERVED AT ORESTIMBA CREEK DEMONSTRATION RESTORATION PROJECT			
	Common Name	Scientific Name	Plot Locations
STRIGIFORMES			
Tytonidae			
	Barn Owl	<i>Tyto alba</i>	
PICIFORMES			
Picidae			
	Northern Flicker	<i>Colaptes auratus</i>	
PASSERIFORMES			
Tyrannidae			
	Western Kingbird	<i>Tyrannus verticalis</i>	
Corvidae			
	Yellow-billed Magpie	<i>Pica nuttalli</i>	
	American Crow	<i>Corvus brachyrhynchos</i>	
Muscicapidae			
	American Robin	<i>Turdus migratorius</i>	
Stumidae			
	European Starling	<i>Sturnus vulgaris</i>	
Emberizidae			
	Dark-eyed Junco	<i>Junco hyemalis</i>	
	White-crowned Sparrow	<i>Zonotrichia leucophrys</i>	
	Western Meadowlark	<i>Sturnella neglecta</i>	
	Brewer's Blackbird	<i>Euphagus cyanocephalus</i>	
	Brown-headed Cowbird	<i>Molothrus ater</i>	
Fringillidae			
	American Goldfinch	<i>Carduelis tristis</i>	
	House Finch	<i>Carpodacus mexicanus</i>	



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